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PREFACE

This publication presents up-to-date information on quarterly population estimates and population growth components (births, deaths and migration) for the Province of Alberta. These statistics are derived using administrative data files obtained from several government agencies.

Data are also computer-accessible via ASIST (Alberta Statistical Information System) matrices #6128, 6130, 6140 and 6141. Enquiries concerning the publication or requests for additional copies or previous quarterly reports should be directed to:

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Introduction

The purpose of this study is to investigate the effects of the proposed system on the performance of the system. The study is divided into two parts: a theoretical analysis and an experimental evaluation.

Theoretical Analysis

The theoretical analysis is based on the assumption that the system is a linear system. The analysis is performed using the Laplace transform. The results of the analysis show that the system is stable and that the proposed system has a higher bandwidth than the existing system.

Conclusion

The results of the study show that the proposed system is a viable alternative to the existing system. The proposed system has a higher bandwidth and is more stable than the existing system. The study also shows that the proposed system is more efficient than the existing system. The study is limited by the assumption that the system is a linear system. Further research is needed to investigate the effects of the proposed system on non-linear systems.

References

1. [1] J. K. S. [2] J. K. S. [3] J. K. S. [4] J. K. S. [5] J. K. S.

INTRODUCTION

This publication presents estimates of population and growth components (births, deaths and migration) for Alberta for the second quarter of 1988. Also provided are statistics on interprovincial migration flows between Alberta and other provinces, population growth components by census year (1986-1988), and population by five-year age group and sex for June 1, 1987 and 1988.

An analysis of recent population trends is contained in the following section and detailed population statistics are produced in Tables 1 to 6. Accompanying these tables are three figures to illustrate trends in: (1) major population growth components, (2) gross flow of interprovincial migration, and (3) population exchange between Alberta and other provinces.

As an annual feature, this Second Quarter report includes a section on the changing age-sex structure of the Alberta population (Table 6).

A complete description of the methodology and information sources used in deriving the estimates is presented in the appendix.

REVIEW OF THE DATA

In the second quarter, net migration to Alberta reached its highest level since the fourth quarter of 1985. The second quarter migration gain was much larger than that of the first, reflecting both a smaller net interprovincial outflow and an unusually large inflow from international sources.

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More specifically:

Quarterly Growth

- Over the past three months, the province's population grew by 9,300, about 40% more than the previous quarter's growth, reaching a level of 2,400,100 on July 1, 1988.
- The increased quarterly growth was primarily due to a reduction in the net interprovincial outflow from 1,240 in the first quarter to 690 in the second and an increase in the net international inflow from 1,360 to 2,750 (Figure 2 and Table 2). The latter figure represents the highest net inflow since the second quarter of 1982.
- During the quarter, 13,240 in-migrants came to Alberta from other provinces while 13,930 out-migrants left. The resulting net outflow from interprovincial migration was, however, more than offset by the large net gain from international sources.
- British Columbia continued to be the leading province of origin for in-migrants to Alberta (4,550 or 34.4%) and also the prime destination for Alberta's out-migrants (6,350 or 45.6% (Figure 3 and Table 3).

Annual Growth

- In the year ending July 1, Alberta's population increased by 19,030, an annual growth rate of 0.8%.
- During this period Alberta recorded an interprovincial migration inflow of 64,370 and an outflow of 80,370. British Columbia was the top province of origin and destination.

- Net migration from international sources was 7,390, up from the 4,680 recorded in the previous 12 month period.
- The total net migration outflow of 8,610 was more than offset by a natural increase of 27,640 (41,390 births less 13,750 deaths).

Age-Sex Composition (June 1, 1988)

- During the past year, Alberta's overall population continued to age. The median age increased from 29.5 to 29.9. This shift can be attributed both to the aging of the baby-boom generation, as well as to lower fertility rates.
- During the past year, the proportion of 15-24 year olds decreased to 16.1% from 16.6%, while there was a corresponding increase, to 60.1%, for the 25-and-over age group.
- The aging trend is also reflected by the change in the elderly dependency ratio, defined as the proportion of population 65+ to the population aged 15-64. While the child dependency ratio (proportion of aged 0-14 to 15-64) remained unchanged at 35.2% between the two years, the old age dependency ratio rose to 12.8% in the current year from 12.5% in the previous year.

FIGURE 1

POPULATION GROWTH WITH MAJOR COMPONENTS ALBERTA 1986-1988

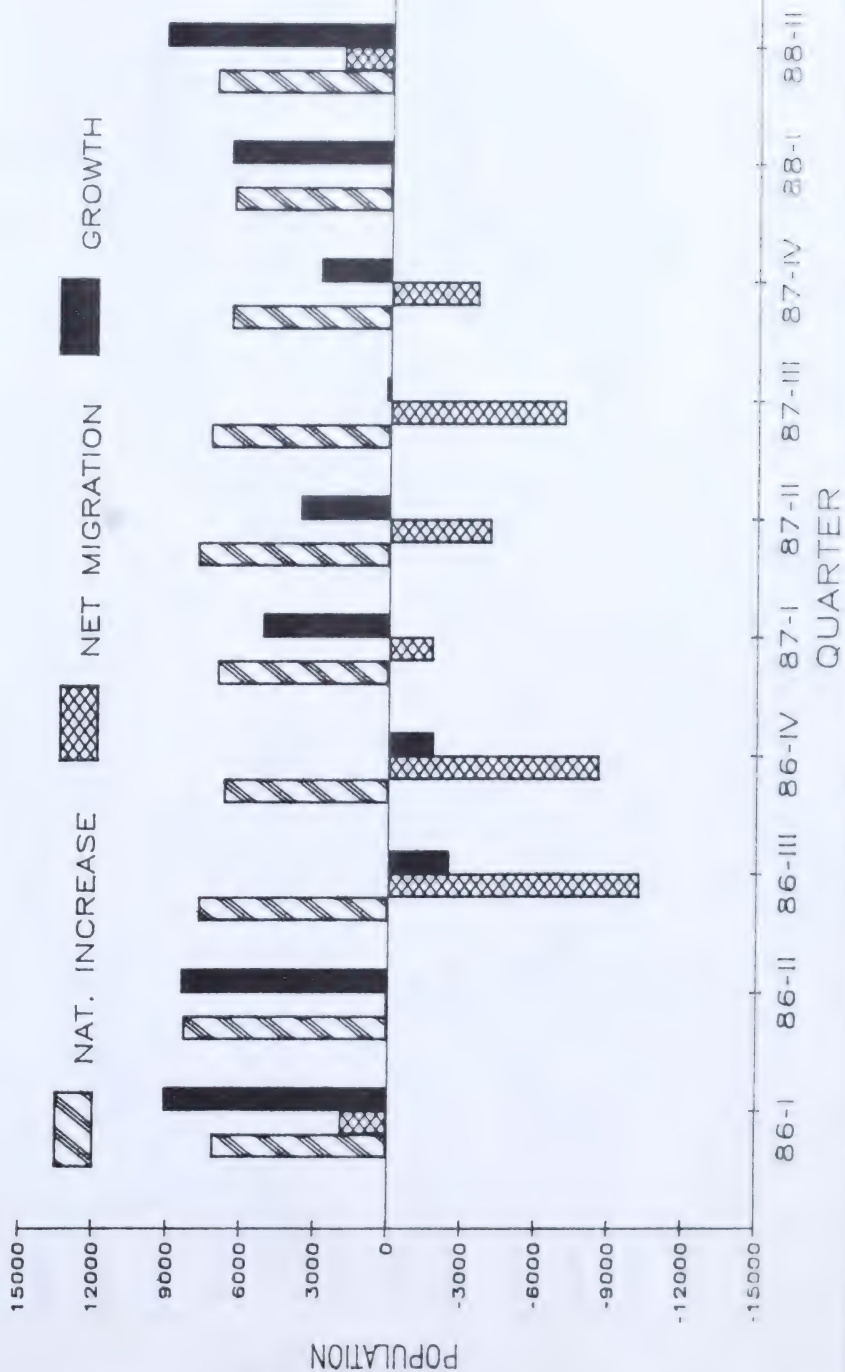


FIGURE 2

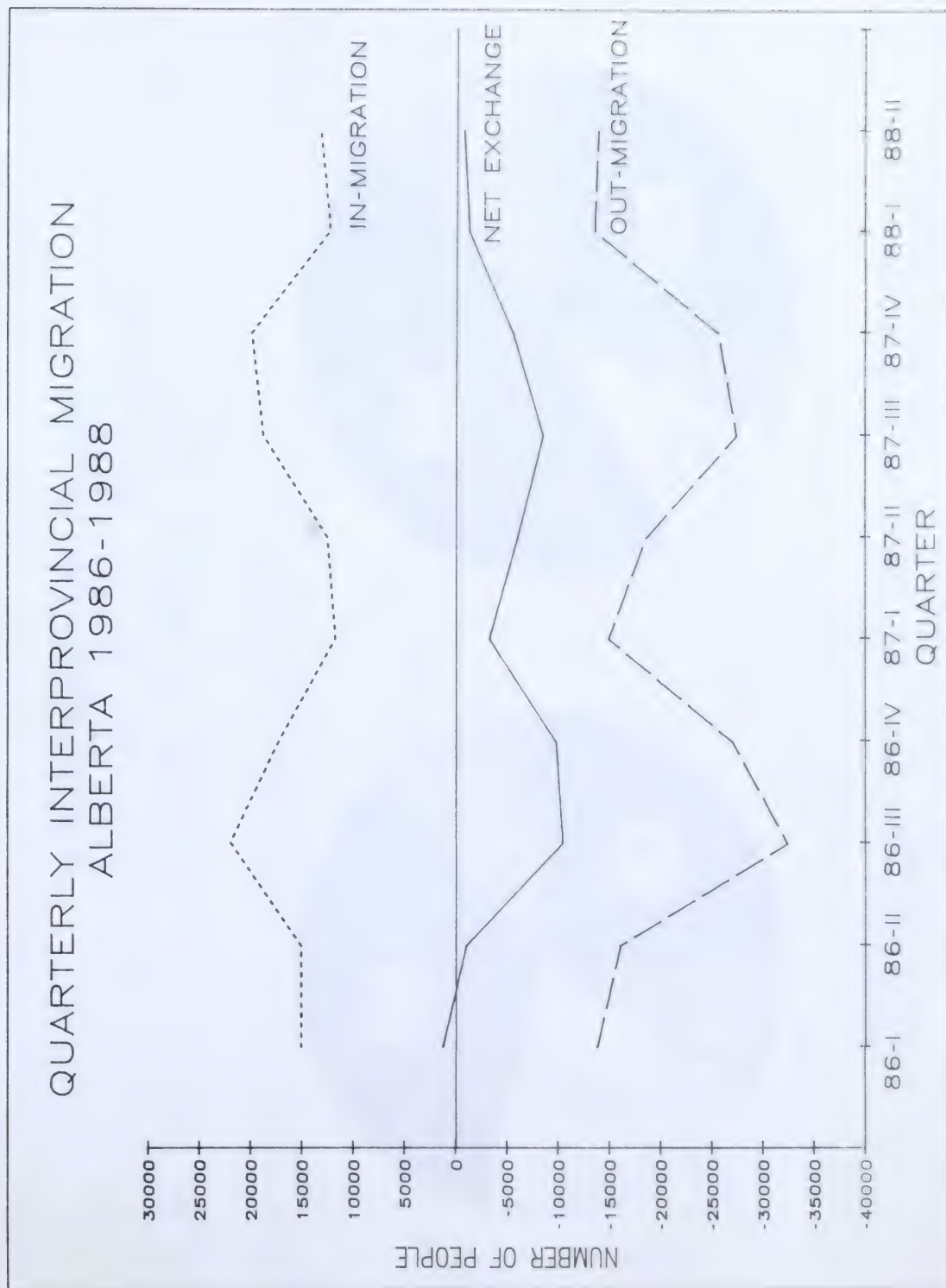


FIGURE 3

POPULATION EXCHANGE
ALBERTA AND OTHER PROVINCES
SECOND QUARTER 1988

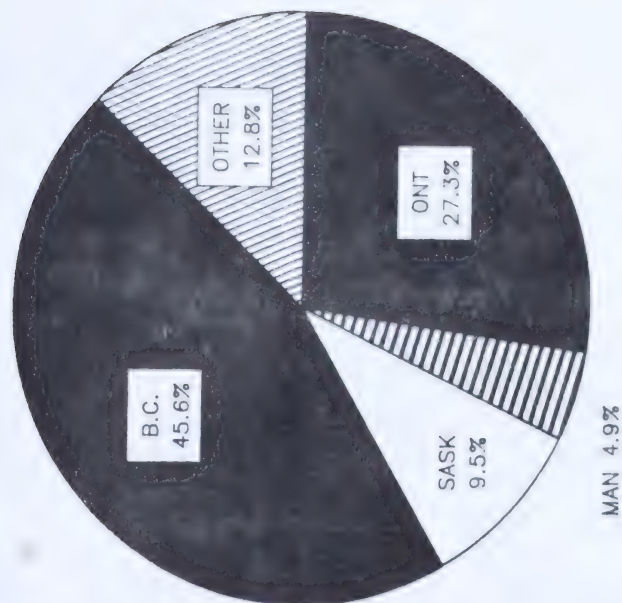
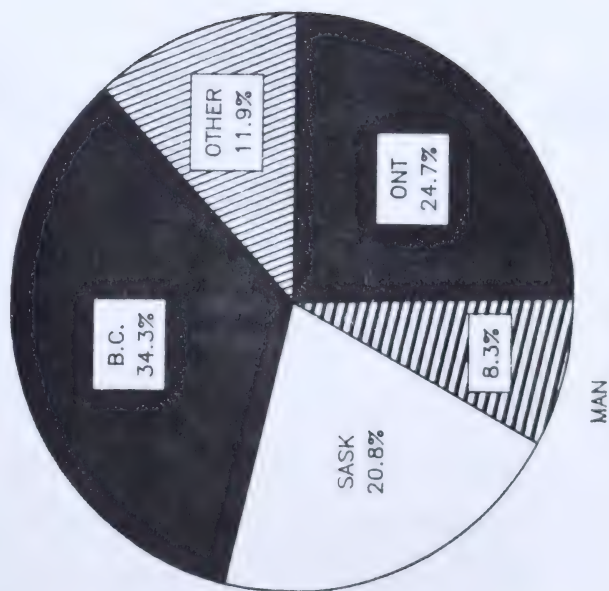


TABLE 1
POPULATION GROWTH BY MAJOR COMPONENT
ALBERTA, 1986 TO 1988

Quarter	Natural Increase	Net Migration	Growth	Population
1986				
I	7,170	1,950	9,120	2,368,200
II	8,360	80	8,440	2,376,600
III	7,760	-10,270	-2,510	2,374,100
IV	6,740	-8,610	-1,870	2,372,200
TOTAL	30,030	-16,850	13,180	2,372,200
1987				
I	7,020	-1,820	5,200	2,377,400
II	7,860	-4,180	3,680	2,381,100
III	7,360	-7,170	190	2,381,300
IV	6,550	-3,620	2,930	2,384,200
TOTAL	28,790	-16,790	12,000	2,384,200
1988				
Ir	6,490	120	6,610	2,390,800
Iip	7,240	2,060	9,300	2,400,100

Notes: Reference date for population is the first day of the subsequent quarter.
Total population is rounded to the nearest 100.
Data may not add to totals due to rounding.
Data can be retrieved via ASIST matrix 6128.
r: revised
p: preliminary

TABLE 2
MIGRATION BY COMPONENT
ALBERTA, 1986 TO 1988

Quarter	International			Interprovincial		
	Im- migration	Em- igration	Net	In Migration	Out Migration	Net
1986						
I	2,200	1,440	760	15,040	13,850	1,190
II	2,510	1,340	1,170	15,030	16,120	-1,090
III	2,440	2,240	200	21,940	32,410	-10,470
IV	2,400	1,240	1,160	17,200	26,970	-9,770
TOTAL	9,550	6,260	3,290	69,210	89,350	-20,140
1987						
I	2,360	910	1,450	11,650	14,920	-3,270
II	3,000	1,130	1,870	12,520	18,570	-6,050
III	3,320	1,970	1,350	18,820	27,340	-8,520
IV	3,140	1,210	1,930	20,010	25,560	-5,550
TOTAL	11,820	5,220	6,600	63,000	86,390	-23,390
1988						
I	2,450	1,090	1,360	12,300	13,540	-1,240
IIp	3,900	1,150	2,750	13,240	13,930	-690

Notes: Data may not add to totals due to rounding.
Data can be retrieved via ASIST matrices 6128 and 6130.
p: preliminary

TABLE 3
POPULATION EXCHANGE WITH OTHER PROVINCES
ALBERTA, 1987 TO 1988

Quarter	Migration	NFLD	PEI	NS	NB	QUE	ONT	MAN	SASK	BC	TEER	TOTAL
1987												
I	To Alta.	300	20	360	200	250	2830	980	2070	4320	310	11650
	From Alta.	150	30	380	180	600	5580	850	1540	5220	600	14920
	Net Exchange	150	-10	-20	20	-350	-2750	130	530	-900	-90	-3270
II	To Alta.	340	110	260	250	420	2710	1060	2470	4600	300	12520
	From Alta.	280	90	500	310	680	6290	1080	1950	6960	440	18570
	Net Exchange	60	20	-240	-60	-260	-3580	-20	520	-2360	-140	-6050
III	To Alta.	310	160	630	480	930	4500	1790	3570	5560	600	10920
	From Alta.	290	140	950	610	1090	9160	1710	2150	10610	540	27340
	Net Exchange	-80	20	-320	-130	-160	-4660	80	1420	-4750	60	-8520
IV	To Alta.	300	70	710	510	850	5020	1580	3810	6440	720	20010
	From Alta.	440	80	810	430	790	7720	1560	2440	10720	570	25560
	Net Exchange	-140	-10	-100	80	60	-2700	20	1370	-4280	160	-5550
TOTAL	To Alta.	1250	360	1960	1440	2450	15060	5410	11920	21220	1940	47000
	From Alta.	1260	340	2640	1530	3160	28750	5200	8080	33510	1950	66390
	Net Exchange	-10	20	-680	-90	-710	-13690	210	3040	-12290	-10	-23390

See notes at end of table

TABLE 3 (concluded)

POPULATION EXCHANGE WITH OTHER PROVINCES
ALBERTA, 1987 TO 1988

Quarter	Migration	NFLD	PEI	NS	NB	QUE	ONT	MAN	SASK	BC	TERR	TOTAL
1988												
I	To Alta.	200	10	250	150	350	3240	790	2800	4270	270	12100
	From Alta.	210	90	280	140	350	3730	750	1370	6340	280	13540
	Net Exchange	-10	-80	-30	10	0	-490	40	1430	-2070	-10	-1240
IIp	To Alta.	160	60	280	230	580	3270	1100	2750	4550	270	13240
	From Alta.	230	80	320	250	480	3810	680	1320	6350	420	13930
	Net Exchange	-70	-20	-40	-20	100	-540	420	1430	-1800	-150	-690

Notes: Estimates are based on family allowance transfers, Health and Welfare Canada.
Data may not add to totals due to rounding.
Data can be retrieved via ASIST matrix 6130.
p: preliminary

TABLE 4
NATURAL INCREASE BY COMPONENT
ALBERTA, 1986 TO 1988

Quarter	Births	Deaths	Natural Increase
1986			
I	10,660	3,490	7,170
II	11,760	3,400	8,360
III	11,040	3,280	7,760
IV	10,310	3,470	6,840
TOTAL	43,670	13,640	30,030
1987			
I	10,310	3,290	7,020
II	11,240	3,380	7,860
III	10,660	3,300	7,360
IV	9,950	3,400	6,550
TOTAL	42,160	13,370	28,790
1988			
Ir	10,170	3,680	6,490
Iip	10,610	3,370	7,240

Notes: Data may not add to totals due to rounding.
Data can be retrieved via ASIST matrix 6128.
r: revised
p: preliminary

TABLE 5
POPULATION GROWTH BY GROUP, 1986, BY COMPONENT
ALBERTA, 1986 TO 1988

	1986-87	1987-88
POPULATION 1986 CENSUS (June 3) 2,475,360		
COMPONENTS OF GROWTH		
Migration		
Interprovincial		
In-migration	61,270	68,790
Out-migration	90,200	82,620
Net migration	-28,910	17,200
International		
Immigration	10,230	12,340
Emigration	5,770	5,100
Net migration	4,460	7,210
Total Net Migration	-24,440	-10,620
Births	42,820	41,560
Deaths	15,410	14,130
Natural Increase	28,410	27,430
ANNUAL GROWTH	4,970	17,210
POPULATION (June 1)*	2,280,200	2,297,400

p:preliminary

*Reference date for population is June 1,

Data may not add due to rounding.

TABLE 6

POPULATION ESTIMATES BY FIVE-YEAR AGE GROUP AND SEX, ALBERTA

June 1, 1988

June 1, 1987

Age	Male		Female		Total		Male		Female		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-4	105,200	8.7	99,700	8.4	204,900	8.5	104,000	8.9	100,700	8.5	204,700	8.7
5-9	98,000	8.1	93,300	7.8	191,400	8.0	96,300	8.0	91,400	7.7	187,700	7.9
10-14	89,200	7.4	84,700	7.1	173,900	7.3	88,900	7.4	84,500	7.1	173,400	7.3
15-19	92,300	7.7	88,300	7.4	180,600	7.5	92,100	7.8	89,200	7.5	181,300	7.7
20-24	102,000	8.5	102,800	8.6	204,800	8.5	105,300	8.8	100,400	8.2	205,700	9.0
25-29	123,300	10.2	123,000	10.3	246,300	10.3	126,400	10.6	124,900	10.6	251,300	10.6
30-34	127,700	10.2	116,400	9.8	244,100	10.0	121,000	10.1	110,100	9.6	231,100	9.9
35-39	99,400	8.2	94,400	7.9	193,800	8.1	97,200	8.1	92,400	7.8	189,600	8.0
40-44	79,900	6.6	77,100	6.5	157,000	6.6	76,000	6.4	73,100	6.2	149,100	6.3
45-49	60,600	5.0	58,200	4.9	118,800	5.0	58,400	4.9	55,600	4.7	114,000	4.8
50-54	52,000	4.3	49,400	4.1	101,400	4.2	52,000	4.3	49,200	4.2	101,200	4.3
55-59	49,100	4.1	46,400	3.9	95,400	4.0	48,500	4.1	45,900	3.9	94,500	4.0
60-64	40,500	3.4	41,800	3.5	82,300	3.4	39,500	3.3	41,500	3.5	81,000	3.4
65-69	32,700	2.7	37,300	3.1	70,000	2.9	31,500	2.6	36,000	3.0	67,500	2.8
70-74	24,300	2.0	29,700	2.5	53,800	2.2	23,800	2.0	29,100	2.5	52,900	2.2
75-79	16,000	1.4	22,000	1.8	38,000	1.6	16,300	1.4	21,100	1.8	37,300	1.6
80-84	10,500	0.9	15,000	1.3	25,200	1.1	10,100	0.8	14,200	1.2	24,300	1.0
85-89	4,900	0.4	8,000	0.7	12,900	0.5	4,600	0.4	7,700	0.7	12,300	0.5
90+	2,200	0.2	4,500	0.4	6,700	0.3	2,300	0.2	4,300	0.4	6,600	0.3
TOTAL	1,205,400	100.0	1,192,000	100.0	2,397,400	100.0	1,186,800	100.0	1,183,400	100.0	2,370,200	100.0

Notes: Age and sex distributions based on Alberta Health Care Registrations.
 Data may add to totals due to rounding.

Data are age-adjusted via 1987 rates (471)

APPENDIX

METHODOLOGY

Introduction

These estimates are derived using information from administrative data files obtained from the following government agencies:

- 1) birth and death registrations from Vital Statistics Section, Alberta Community and Occupational Health;
- 2) family allowance transfer of accounts data from Income Security Branch, Health and Welfare Canada;
- 3) immigration statistics from Employment and Immigration Canada;
- 4) migration adjustment factors and population estimates for other provinces from Demography Division, Statistics Canada; and
- 5) health care registration data from Alberta Hospitals and Medical Care.

The final estimates are produced using a component method. A description of the basic methodology and the procedures used in estimating each of the population growth components, as well as the age-sex structure is presented in the following sections.

The Component Method

The component method of estimating quarterly population growth employs the population of a previous quarter as a base, and adds the natural increase plus net migration to derive the population estimates for the following quarter. Natural increase is obtained by subtracting deaths from births. Net migration is obtained by aggregating net interprovincial (in-migration minus

out-migration) and net international migration (immigration minus emigration). These are then combined to derive an estimate of population growth. The general formulas used are as follows:

$$P_{t+1} = P_t + NI_{t+1} + NM_{t+1}$$

$$NI_{t+1} = B_{t+1} - D_{t+1}$$

$$NM_{t+1} = (MI_{t+1} - MO_{t+1}) + (I_{t+1} - E_{t+1})$$

Where,

P_t = Population at time of t

NI_{t+1} = Natural Increase during time interval t to $t+1$

B_{t+1} = Number of births during time interval t to $t+1$

D_{t+1} = Number of deaths during time interval t to $t+1$

NM_{t+1} = Net migration during time interval t to $t+1$

MI_{t+1} = Number of in-migrants to Alberta from the rest of Canada during time interval t to $t+1$

MO_{t+1} = Number of out-migrants from Alberta to the rest of Canada during time interval t to $t+1$

I_{t+1} = Number of immigrants to Alberta from abroad during time interval t to $t+1$

E_{t+1} = Number of emigrants from Alberta to abroad during time interval t to $t+1$

Natural Increase

Natural increase is calculated as the difference between the number of births and the number of deaths that occurred during a specific quarter. Preliminary estimates on births and deaths are produced using birth and death rates. The average quarterly crude birth rate and the crude death rate of the preceding year are applied to the estimated provincial population at the beginning of the period to derive the estimated number of births and deaths. These estimates will be replaced by actual counts in a subsequent quarterly report when final vital statistics data are available from Vital Statistics Section, Community and Occupational Health. These data on births and deaths are about 98% accurate.

Interprovincial Migration

To estimate interprovincial migration, family allowance transfer of accounts are used in conjunction with the latest adjustment factors and child-adult ratios. Since family allowance cheques are mailed to the families monthly, there is incentive for these families to report any change in their address. The time lag in reporting such change is usually very small. Over the years family allowance transfer of accounts data have been an accurate source of the movements of children among the provinces.

The procedures used in estimating interprovincial migration for Alberta are further improved by incorporating additional information from tax records migration data. Net interprovincial migration (MP) is derived as the balance of

in-migration (MI) and out-migration (MO):

$$MP = MI - MO$$

In-migration (MI) is estimated as the sum of:

$$MI = \sum_{k=1}^{10} (I_{ck} + I_{ak})$$

Where I_{ck} is the number of child-migrants from province k to Alberta obtained from family allowance, and I_{ak} is the number of adult-migrants from province k to Alberta estimated as follows:

$$I_{ak} = I_{ck} \cdot R_k \cdot F_{ik}$$

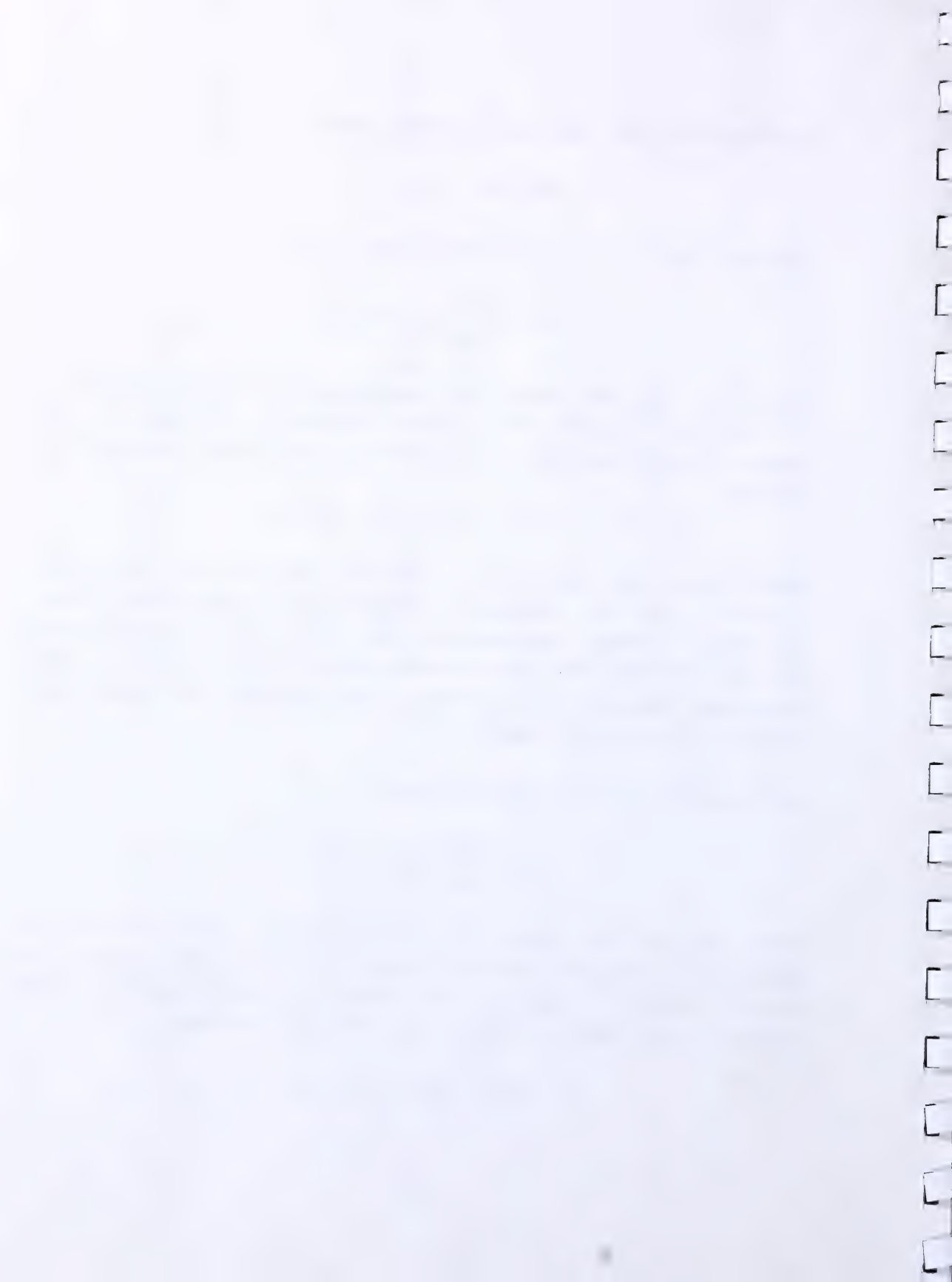
Where R_k is the adult-child ratio of the province of origin k , and F_{ik} is the adjustment factor for in-migration, i.e., the ratio of adult in-migration rate to the child in-migration rate as derived from tax record migration information. The adjustment factors, as mentioned, are obtained from Demography Division, Statistics Canada.

Out-migration (MO) is estimated as:

$$MO = \sum_{k=1}^{10} (O_{ck} + O_{ak})$$

Where O_{ck} is the number of child-migrants from Alberta to province k . This is obtained from family allowance transfer of accounts data. O_{ak} is the number of adult-migrants from Alberta to province k . It is calculated as follows:

$$O_{ak} = O_{ck} \cdot R \cdot F_{ok}$$



Where R is the adult-child ratio of Alberta, and F_{Ok} is the adjustment factor for out-migration supplied by Demography Division, Statistics Canada.

The adult-child ratios and the adjustment factors for in-migration (F_I) and out-migration (F_O) used in the computation of interprovincial migration are provided in Table A.

Table A

Adult-Child Ratios and Migration Adjustment Factors by Province

	Adult-child Ratio	Adjustment F_I	Factor ¹ F_O
Newfoundland	2.2668	1.4190	0.8791
Prince Edward Island	2.5950	1.4645	1.2625
Nova Scotia	2.8836	0.9810	1.0434
New Brunswick	2.6958	1.0830	0.9528
Quebec	3.1140	1.2976	1.0156
Ontario	3.0491	0.9501	0.9868
Manitoba	2.7429	0.9511	0.9116
Saskatchewan	2.4622	0.9307	0.8468
Alberta	2.5448	--	--
British Columbia	3.1006	0.9011	1.1415
Yukon	2.3733	1.4503	0.8520
N.W. Territories	1.6162	1.5105	0.8364

Source: ¹Unpublished data provided by Demography Division, Statistics Canada.

Immigration

The estimate of immigration is first produced on a preliminary basis and then revised when immigration statistics become available. Preliminary estimates are derived taking into consideration the expected number of immigrants to be admitted to Canada in a certain year as announced by Employment and Immigration Canada. Based on the historical immigration records a ratio is derived to estimate Alberta's share of the total immigrants coming to Canada.

The final estimate of immigrants coming to Alberta are based on statistics compiled from immigration papers which each immigrant submits to the Canadian authority at the port of entry. The immigration papers contain information on the intended place of destination and the place of origin of the immigrant. Since this information is available monthly, the quarterly estimate of immigrants intending to come to Alberta can be calculated. These revised figures are obtained by the subsequent quarter and thus the current quarterly publication updates the previous preliminary estimates.

Emigration

Emigration estimates are derived from a method developed by Statistics Canada in which an adjustment factor is developed from emigration information retrieved from personal income tax files. This adjustment factor is applied to the number of family allowance accounts which have been transferred out of the country during the quarter to obtain the emigration estimate. For 1988, the adjustment factor used is 0.931908 which is derived from personal income tax files for 1986, the most recent available.

An adult-child ratio based on Alberta health care registration records is then applied to estimate the number of adult emigrants. The sum of estimated adult emigrants and child emigrants, as indicated by family allowance data, equals to the total number of estimated emigrants.

Age-Sex Structure

Age and sex distributions for the January 1 and June 1 estimated population are derived by applying the proportionate age and sex distributions as recorded in the Alberta Health Care Insurance Plan (AHCIP) Master Registration File. Although the health care records are subject to certain limitations such as reporting error, time lags and administrative changes, the age and sex distributions of registrants have proven to accurately reflect the most current age-sex structure of the Alberta population.

Limitations of the Population Estimates

Overall, the population change due to natural increase is most reliable, since the birth and death registration records are virtually 100% complete. Of the other components of population change, migration estimates are more prone to error due to the limitations of the administrative data files used. Family allowance, health care and tax records, however, have historically proven to be an excellent information sources on population and migration.

Alberta Bureau of Statistics has investigated the characteristics of each of these data files, to identify problem areas and to develop modifications in the methodology to minimize the effects of any problems on the population estimates. To this end, Alberta Bureau of Statistics has worked closely with Demography Division, Statistics Canada and will continue to monitor and test latest developments in population estimation methodology.

GLOSSARY

Birth Rate, or Crude Birth Rate - the number of births in a year divided by the total population.

Child Dependency Ratio - the ratio of children under 15 to working-age persons between the ages of 15 and 64.

Death Rate, or Crude Death Rate - the number of deaths in a year divided by the total population.

Emigration - the migration of population out of a country to another country.

Fertility - the contribution of births to population change.

Immigration - the migration of population into a country from another country.

In-migration - the migration of population into a geographical area.

Median Age - the age at which the population is divided into equal halves, such that one half of the population is older than the median age and the other half of the population is younger than the median age.

Migration - a permanent change of residence from one geographical area to another.

Natural Increase - the net contribution of births less deaths to population change.

Net Migration - the difference between in-migration and out-migration for a geographical area.

Old Age Dependency Ratio - the ratio of persons aged 65 years and over to working-age persons between the ages of 15 and 64.

Out-migration - the migration of population out of a geographical area.

GLOSSARY

- Birth Rate, or Crude Birth Rate** - the number of births in a year divided by the total population.
- Child Dependency Ratio** - the ratio of children under 15 to working-age persons between the ages of 15 and 64.
- Death Rate, or Crude Death Rate** - the number of deaths in a year divided by the total population.
- Emigration** - the migration of population out of a country, to another country.
- Fertility** - the contribution of women to population growth.
- Immigration** - the migration of population into a country from another country.
- In-migration** - the migration of population into a geographical area.
- Median Age** - the age at which the population is divided into equal halves, with half of the population is older than the median age and the other half of the population is younger than the median age.
- Migration** - a permanent change of residence from one geographical area to another.
- Natural Increase** - the net contribution of births less deaths to population change.
- Net Migration** - the difference between immigration and out-migration for a geographical area.
- Old Age Dependency Ratio** - the ratio of persons aged 65 and over to working-age persons between the ages of 15 and 64.
- Out-migration** - the migration of population out of a geographical area.

